The European Proceedings of
Social & Behavioural Sciences
EpSBS

Future Academy

ISSN: 2357-1330

http://dx.doi.org/10.15405/epsbs.2017.10.73

8th ICEEPSY 2017
The International Conference On Education And Educational Psychology

SENSORY INTEGRATION THERAPY OF A SIX YEAR-OLD GIRL: A CASE STUDY

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Abstract

The main problem of the study was formulated as follows: what kind of change was observed during Sensory Integration Therapy in M - a 6 year-old girl? The specific question was whether M`s functioning had changed during the one and a half years of sensory integration therapy in terms of the reactions of vestibular and proprioceptive systems, as well as touch, coordination, muscular tension, hearing, sight, smell, taste, self-control and attention focus. The purpose of the study was to show the potential of SI therapy in terms of improving sensory systems functioning and quality of life of a 6 year-old girl with registration and modulation problems as well as hearing and sight deficiency.

To solve the problem clinical observation was used. The child`s behavior during examination and her spontaneous reactions were also observed. The Sensorimotor Skills Questionnaire by Karga was used on the basis of conversation with M`s mother. Data gathered before therapy and after a year and a half of its duration were compared. Therapy consisted mainly of exercises stimulating vestibular and proprioceptive systems, sound discrimination, touch, hearing, sight and smell.

After a year and a half of therapy, a significant decrease in the frequency of M's unfavourable reactions was registered in the areas of touch ($\chi 2=14,45$; $p=0,0001$), proprioception ($\chi 2=10,56$; $p=0,001$), hearing ($\chi 2=7,07$; $p=0,008$) and self-regulation and attention ($\chi 2=8,71$; $p=0,003$). Vomit reactions and tendency to taste uneatable objects disappeared. The girl started to express verbally satisfaction with her progress. A year and a half of SI therapy increased M`s well-being.

Keywords: Sensory integration therapy, case study.

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Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

1. Introduction

A. J. Ayres (2005) defines sensory integration (SI) as a process of organizing sensory input, which through information selection gives it meaning and allows to react purposefully to sensory stimuli. Theory proposed by A. J. Ayres assumes that sensory integration plays essential role in adaptive processes (Ayres, 2005, Schaaf, Miller, 2005). Integration of sensory systems which form in the phase of an embryo develop gradually until childhood as a result of motor activity. Sensory integration problems may affect cognitive functioning, and as a result learning and speech development . The theory indicated the role of poor sensory integration in the origin of learning difficulties (Chuang, Kuo, 2016). Dysfunction of sensory integration is defined as neurological problem with processing information from the senses (Leong et al. 2015). Sensory processing difficulties include dysfunctions in sensory modulation and discrimination as well as problems in motor functioning which have sensory foundation (Kranowitz, 2006). Sensory integration problems result from disturbances in sensory data flow and improper connections on neural ways transmitting sensory imput in the brain. As a result a person obtains unreliable sensory data and experiences difficulty in analyzing everyday events and reacting properly. Sensory integration problems concern 5-13% of preschool children, mainly with autism and ADHD (Biel, 2014).

Sensory integration therapy (SIT) is based on controlled stimulation of senses (Leong et al., 2015). The therapy is based on brain plasticity, adaptive potential of sensory system which results from previous sensory and motor experiences and organism`s tendency to search for sensory stimuli which are favourable for its development. The basis of sensory integration therapeutic techniques is compensation through habit formation (Pyda – Dulewicz et al. 2014).

Leong and coworkers (2015) performed a meta-analysis of research reports concerned with sensory integration therapy effectiveness. The most important criteria the authors took into consideration were the following elements: use of sessions devoted solely to sensory integration therapy, reference to A. J. Ayres theory, specific description of therapy and stimulation provided for vestibular and proprioceptive system, stimulation of touch, stimulation of other senses like sight, hearing, smell, taste, detailed therapy description, use of diagnostic tools evaluating sensory problems and treatment effectiveness, clear criteria of qualification to treatment, presence of control or alternative therapy group (Leong et al. 2015). The research of the analysis revealed that the methodological flaws which could be found in almost all reports taken into consideration were: lack of specific description of sensory diet prescribed, not taking advantage of weighted wests, Wilbarger joint compression and brushing. The results of the meta-analysis of the research concerned with SI therapy effectiveness showed that SI can be regarded as therapy providing significant but small effect in comparison to the lack of treatment. However no evidence was found in favour of SI effectiveness in comparison to other kinds of treatment (Leong et al. 2015).

Research review by Iwanaga and coworkers (2014) showed that In the case of children with learning difficulties and developmental coordination disorder who undergone SI therapy sessions, improvement was observed in terms of sensory-motor functioning, motor planning and reading. Own research conducted by Iwanaga et al. (2014) in the group of 8 children with autism, Asperger`s disorder or pervasive developmental disorder who underwent SI therapy for eight months, showed significant

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improvement in movement coordination and non-verbal cognitive skills. However, no improvement of verbal skills was registered.

S. Faramarzi and coworkers (2016) proved in experimental design that sensory integration therapy may improve executive functions in teens with ADHD. The experiment involved 20 boys diagnosed with ADHD: 10 in control group and 10 in experimental group. Students from experimental group took part in twelve 45-minute sessions of sensory integration therapy for six weeks. During therapy period significantly higher decrease in average score of Conner Scale was observed in experimental group, showing more improvement in executive functions in comparison to control group not taking part in sensory integration therapy.

Observations of SI practitioners described in literature indicate that this kind of therapy enhances client`s ability to focus on learning material, improvements in cognitive abilities manifested in language and reading and decrease of challenging behaviours (Devlin et al. 2011).

Selected case studies show various effects of Sensory Integration Therapy. For example Schaaf and McKeon Nightlinger (2007) presented the case of 4-yeard old boy experiencing problems with verbal expression, dyspraxia, fear reactions to movement activities and excessive aversive reactions to touch and numerous kinds of food. Goal – attaining scales were used. Improvement was observed concerning fear reactions to movement, participation motor activities, social interactions and aversion to tactile stimuli in oral cavity.

The results of the research concerning effects of sensory integration therapy are inconclusive. Studies comparing groups of participants show no or small effect of this kind of treatment. Case studies indicate benefits of sensory integration therapy. Therefore it seems valuable to increase the scope of data concerning reactions of clients with various kinds of sensory integration disorders to therapy aimed at integration of sensory input processing.

2. Problem Statement

M is 6,5 years old girl. She was born by caesarean without left heart chamber. The child achieved 9 points out of 10 in Apgar scale. Her birth weight was 3450 g. M was hospitalized for four months after birth. As far as motor development is concerned she did not crawl and started to walk independently when she was 1,5 years of age. M was diagnosed with delayed speech development, low muscle tension and neurodevelopmental disorders, as well as sensory registration and modulation disorders. She undergone several cardiac malformation and sternum surgeries. She also has substantial hearing loss and visual impairment.

M is sensory stimulation seeker and is characterized by excessive reactivity and changeable reactivity. Observation showed that M had constant need for sensory input. During examination her activity was high and unstable. M`s attention was poorly modulated, focused on strong incentives from sensory input, no significant learning could be registered. She expressed her emotions in diverse ways. The girl was very labile and had high anxiety level. In case of sensory overstimulation M might become excited and react impulsively and by taking risks. She was excessively reactive and resistant to touch stimuli. Marta had difficulty with noticing and discriminating hearing incentives. She had excessive reactivity to smell. In the area of mouth under-reactivity was noticeable.

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M had deficiencies in muscle tension, balance and movement coordination. There were noticeable problems in functioning of her proprioceptive and vestibular systems. The girl had difficulty in feeling her body and detecting its position in space which resulted in difficulties in maintaining body posture, quality, precision and coordination of her movements and poor motor skills learning. M was diagnosed with dyspraxia. She had difficulties with movement patterns, maintaining balance, reacting simultaneously with both sides of her body (bilateral coordination). Generally, M had difficulties with imagining, planning, organizing and performing new movement sequences.

Given the results of M`s diagnosis and her multiple deficiencies the main problem of the research was formulated as follows: what kind of change was observed during sensory integration therapy in M- a 6-years-old girl?

3. Research Questions

In assessing changes resulting from sensory integration therapy, functioning in the area of vestibular and proprioceptive system as well as basic senses was taken into consideration. Observing socio-emotional reactions was also recognized as important. Therefore the specific research question following from the problem was whether M`s functioning has changed during one and a half year SI therapy in terms of

- vestibular system
- proprioception
- touch,
- coordination,
- muscular tension,
- hearing,
- sight,
- smell and taste, and
- self - control and attention focus?

Nine hypotheses were formulated. The hypotheses concerned the decrease of the number of unfavourable M`s behaviours reflecting problems in reactions connected with:

- vestibular system (H1),
- proprioception (H2),
- touch (H3),
- coordination (H4),
- musccle tension (H5),
- hearing (H6),
- sight (H7),
- smell and taste (H8),
- self-control and attention Focus (H9).

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4. Purpose of the Study

The purpose of the study was to show potential of SI therapy in terms of increasing sensory systems functioning and quality of life in 6 - years-old girl with registration and modulation problems as well as hearing and sight deficiency

5. Research Methods

5.1. Procedure - therapy description

M took part in formal sensory integration therapy sessions and had her sensory diet prescribed indicating everyday activities at home. Apart from sensory integration therapy she also benefited from consultations with a psychologist.

Sensory integration therapy sessions were held twice a week in a sensory integration room with certified equipment. The sessions were led by the main Author holding official certificate of Polish Sensory Integration Therapy association Certificate. The document enables for diagnosis of sensory integration problems as well as planning and conducting SI therapy. Typical session lasted 55 minutes, followed by conversation with M`s Mother on child`s progress and recommended activities. Each therapy session started with greeting by a song or short poem. Next there was a motor warm-up. The main part consisted usually with a touch course, vestibular and proprioceptive stimulation combined with sight and motor coordination exercises, for example swinging in suspense swing with catching objects and throwing them into a target and jumps with soap bubble catching. Then praxis was exercised during moving through obstacle course. Next, there was pulling heavy objects which stimulates of deep proprioception. The session consisted also with manual exercises. The last part of session consisted of deep proprioception and smell stimulation while M was lying under weighted blanket.

During therapy in a sensory integration room vestibular and proprioceptive system, as well as senses were stimulated. The following are exercises which were used during typical sessions with M.

Vestibular and proprioceptive systems were stimulated by: sequences of movements on obstacle courses, wrapping a child in a mat and rolling, applying pressure with a ball, forward, backward and sideways movement on sensory integration equipment with body position change, jumping on both feet and plays engaging balance.

Activities involving touch were massages with various textures with decreasing delicacy, exercising in recognizing objects or textures without looking, strengthening palms with hand exercise balls, arm wrestling, rope pulling and pushing heavy objects.

To exercise hearing the following activities were used: recognizing sounds of musical instruments, determining a place from which sound is emitted and massaging the bowl of the ear.

The following sight exercises were applied: bouncing a ball hanging from the ceiling with a hand or a racket, catching a ball, throwing bags filled with various materials at a target, playing with soap bubbles, aiming flashlight at various objects in a darkened room, following moving object with one`s eyes, making “drawings” with a flashlight in a darkened room.

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Taste and smell were stimulated by using various scented oils and naming the scents (for example lavender, orange oil).

M was also prescribed a sensory diet - a set of exercises and activities aimed at enhancing sensory integration to perform daily at home. The diet consisted mainly with Wilbarger`s deep massage, applying weighted blanket, chewing dried fruit, pulling and pushing heavy objects. As far as environmental change was concerned removing sources of distraction and introducing stimuli organizing attention focus was recommended. Outdoor activities on a playground and reinforcing alternative behaviours was also suggested.

5.2. Instruments

Sensorimotor Skills Questionnaire by M. Karga, clinical observation worksheet and observation of child`s spontaneous behavior was used. The trial to administer Southern California Integration Test during initial diagnosis proved that the instrument is not applicable in M`s case.

Sensorimotor Skills Questionnaire was filled on the basis of conversation with M`s Mother. The data reflecting child`s behavior in her natural environment was gathered before therapy and after a year and a half of its duration.

Sensorimotor Skills Questionnaire by Karga et al. consists of five parts measuring areas of child`s behaviour connected with functioning of touch, vestibular system, coordination, proprioception, muscular tension, sight, taste, hearing, smell, as well as self-regulation and attention focus. Each scale consists of statements describing child`s behavior. Applicability of each statement to a child is rated by answering “yes” or “no”. Space for parent`s notes and explanations is also provided for each statement. The examples of statements in each scale are the following:

- Touch – 38 statements, like: “does not like to be hugged or touched, reacts to touch as if it was painful and unpleasant”, often seems not to notice that he or she was hit”.
- Vestibular system – 19 statements, for example “reacts negatively when playing outdoors and changes body position”, “frequently swings on a chair”.
- Coordination – 9 statement like the following: “has difficulty in operating scissors, drawing or writing”.
- Proprioception – 9 statements. Examples are: “bumps into objects”, “has to look at what he or she is doing”.
- Muscular tension -8 statements, including: “his posture while standing or sitting is improper” “seems stronger of weaker than his or her peers”.
- Sight, - 12 statements, for example: “has difficulty in fixing his or her sight on an object”, “ seems too sensitive to light”.
- Taste – 5 statements – exemplary items are: “demands certain kinds of food” , “does not like food of a certain consistency”.
- Sound – 14 statements including: “is afraid of certain sounds”, “ often is not able to determine sound direction”.

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- Smell - 5 statements, for example: “has difficulty in discriminating various scents”, “reacts negatively to many scents”.
- Self-regulation and attention focus – 12 statements, including: “reacts emotionally in and unpredictable manner”.

During initial diagnosis it was revealed that not all Questionnaire statements were applicable to M.

Clinical observation sheet constructed by M. Karga was also. used During clinical observation attention was drawn to child`s behavior in the areas of hyperactivity, excitement, reduced level of excitement, attention, touch resistance, muscular tension, eye preference, eyeball movements, finger movements, tonque movements, jumping on assigned areas, “feet after feet” walk, ball catching, and recognizing left and right side.

Observation of spontaneous child behaviour was also carried out. It focused on child preferences towards objects and activities.

6. Findings

Results include quantitative data from Sensorimotor Skills Questionnaire by M. Karga and qualitative data gathered during clinical observation and observation of child`s spontaneous behavior.

6.1. Changes in sensorimotor functioning – quantitative data

Data reflecting M`s mother observation were gathered with Sensorimotor Skills Questionnaire by M. Karga. Number of unfavourable symptoms recorded and absent in the areas of functioning concerning touch, vestibular system, coordination, proprioception, muscle tension, sight, hearing, smell, and social functioning and attention focus was noted. Data were gathered during initial diagnosis and after 18 months. Results are shown in Table 01.

Significant changes in the number of unfavourable symptoms were recorded in the areas of touch, proprioception, self-regulation and attention focus as well as hearing.

In the area of touch during initial diagnosis 21unfavourable symptoms were recorded as present, 9 as absent. Eighteen months later unfavourable symptoms were observed, while 24 were registered as absent. The change of the number of unfavourable behaviours connected with touch reached significance (χ^2 =15,15; p< 0,001).

During initial diagnosis of proprioceptive system 14 unfavourable symptoms were judged as present, 5 as absent. During diagnosis after 18 months the number of registered unfavourable symptoms was 4, whereas 15 unfavourable symptoms were recorded as absent. This means significant change of the perception of M`s propriocetptive reactions (χ^2 =10,56; p< 0,01).

Significant change was also observed in M`s self- regulation and attention focus (χ^2 =8,71; p< 0,003). Initial diagnosis indicated presence of 11 unfavourable symptoms, and absence of 1. After 18 months the number of unfavourable symptoms registered was 4, while 8 unfavourable symptoms were recorded as absent.

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Table 01. Changes in M`s sensory systems functioning and social behaviour after 1,5 sensory integration therapy.

Area	Diagnosis	Number of unfavourable symptoms		Total	Chi square; significance
		present ("yes" answer)	absent ("no" answer)		
Vestibular system	first diagnosis	9	10	19	χ^2=2,92; ns
	diagnosis after 18 months	4	15	19	
	total	13	25	38	
Proprioception	first diagnosis	14	5	19	χ^2=10,56; p<0,001
	diagnosis after 18 months	4	15	19	
	total	18	20	38	
Muscular tension	first diagnosis	5	3	8	χ^2=1,00; ns
	diagnosis after 18 months	3	5	8	
	total	8	8	16	
Coordination	first diagnosis	7	2	9	χ^2=1,00; ns
	diagnosis after 18 months	5	4	9	
	total	12	6	18	
Touch	first diagnosis	21	9	30	χ^2=15,15; p< 0,001
	diagnosis after 18 months	6	24	30	
	total	27	33	60	
Sight	first diagnosis	5	3	8	χ^2=2,29; ns
	diagnosis after 18 months	2	6	8	
	total	7	9	16	
Hearing	first diagnosis	10	1	11	χ^2=7,07; p<0,008
	diagnosis after 18 months	4	7	11	
	total	14	8	22	
Taste/smell	first diagnosis	3	2	5	χ^2=0,40; ns
	diagnosis after 18 months	2	3	5	
	total	5	5	10	
Self-regulation, focus of attention	first diagnosis	11	1	12	χ^2=8,71; p<0,003
	diagnosis after 18 months	4	8	12	
	total	15	9	24	

In the area of hearing also significant change was recoded χ^2 =7,0715; p< 0,008. However, initial diagnosis indicated the necessity of auditory examination. When M allowed her hearing to be examined, substantial hearing loss was diagnosed. The girl obtained hearing aids. Initial hearing diagnosis showed 10 unfavourable symptoms, with 1 symptom recorded as absent. Diagnosis after 1,5 therapy and support with hearing aids showed presence of 4 unfavourable symptoms in the area of hearing and absence of 7 unfavourable symptoms.

6.2. Changes in in sensorimotor functioning – qualitative data

Qualitative data were gathered in the text form during clinical observation, observation of child`s spontaneous behaviour and M`s Mother comments during answering Sensorimotor Skills Questionnaire statements.

Results concerning changes in M`s functioning during 18 months of sensory integration therapy in the area of vestibular system and proprioception are summarised in Table 02.

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Table 02. Results concerning changes in M`s functioning during year and a half sensory integration therapy in the area of vestibular system and proprioception

System observed	M`s behavior in therapy sessions during initial diagnosis	M`s behavior during sessions after 18 months of sensory integration therapy
Vestibular and proprio ceptive system	Constantly moving in chaotic way, she loses concentration very frequently, her movements lack purpose.	Moves with less intensity than in the beginning of therapy, she can sit and organize play activity, she is more organized and attentive.
	She turns around her main body axis, she excites herself with the movement.	She turns around her main body axis very rarely.
	She swings her body strongly.	She does not have such a strong need to swing her body as in the beginning of therapy. The amplitude of swinging has lessened.
	She jumps on a bed.	She jumps on a bed less frequently, she can turn her attention to other kind of movement.
	She does forward rolls frequently.	She does forward rolls rarely.
	She climbs a table.	She does not climb a table.
	Her reactions and movements are hard to predict.	Her reactions, deeds and movements can be better predicted than in the beginning of therapy.
	She is poorly aware of her body position in space	She has better awareness of her body position in space than in the beginning of the therapy.
	She does not pay attention to what is beneath her feet, falters frequently.	She falters less frequently than in the beginning of therapy.
	She holds objects very tightly.	Her need to hold objects has diminished.

During 18 months of sensory integration therapy the frequency of Marta`s chaotic movements has diminished. Her movements have become more purposeful and predictable. Marta has learned to sit quietly and organize play. She has acquired better awareness of her body in space.

Changes observed in M`s functioning during sensory integration therapy in the area of touch are described in Table 03.

Table 03. Results concerning changes in M`s functioning during year and a half sensory integration therapy in the area of touch

System observed	M`s behavior in therapy sessions during initial diagnosis	M`s behavior during sessions after 18 months of sensory integration therapy
Touch	Distastes body oils and massage creams.	Tolerates body oils and massage creams.
	Does not fasten seat belts when in a car.	Fastens seat belts when in a car.
	Does not like to be touched unexpectedly, she manifests touch resistance when touched by other persons, likes to be touched but only by certain persons, she is extremely susceptible to tickling, does not like combing her hair, likes working with plasticine.	She can function when other people, including her peers are present, her reactions to touch are not as intensive as at the beginning of therapy.
	Does not like washing her hair.	She dislikes tickling sensation when takes shower.

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	Seeks physical contact in an aggressive way: beats, bites, behaves self-aggressively, hits surfaces with her head, goes berserk, pulls out her hair.	Aggressive and self-aggressive behaviours do not occur.

In the area of touch after 18 months of therapy M`s negative reactions to other people`s presence and touch has diminished. Aggressive behaviours have become absent. M has become to tolerate various textures and consistencies of massage oils and creams. M is able to sit in car with seat belts fastened.

Observations of M`s behavior changes during sensory integration therapy in the area of sight are summarized in Table 04.

Table 04. Results concerning changes in M`s functioning during year and a half sensory integration therapy in the area of sight

System observed	M`s behavior in therapy sessions during initial diagnosis	M`s behavior during sessions after 18 months of sensory integration therapy
Sight	Has short fixation periods when tries to concentrate visually on an object.	Her ability to concentrate visually on an object increased, eye-contact with other persons increased.
	M is easily distracted when exposed to many stimuli	-

In the course of SI therapy M`s ability to focus her sight has increased. M gradually starts to increase duration of her eye contact with other people.

Change of M`s functioning during therapy in the area of hearing is presented in Table 05.

Table 05. Results concerning changes in M`s functioning during year and a half sensory integration therapy in the area of hearing

System observed	M`s behavior in therapy sessions during initial diagnosis	M`s behavior during sessions after 18 months of sensory integration therapy
Hearing	M`s Mother claims that her daughter listens when she wants to.	-
	Marta does not allow her hearing to be examined.	Hearing examination succeeded.
	Avoids places where there are other children.	Sometimes joins group of other children.
	Does not stop her ears when exposed to certain sounds, but cries, panics and stops her ears when confronted with sounds, words or sentences which she does not want to listen, especially when she is confronted with topics that irritate her.	After being diagnosed with substantial hearing loss and applying hearing aids Marta does not stop her ears unconsciously in various every - day situations.
	Produces sounds with a pipe	-
	Sings to herself	-
	Speaks to herself a lot during performing daily tasks	Speaks to herself less frequently during performing tasks.
	Likes toys which emit sounds, likes	Tolerates environmental sounds better.

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	listening to loud music, is sensitive to certain melodies; does not like sounds generated by mowing machine, blender and dog barking.	

During therapy the intensity of M`s self-vocalization has diminished. M joins groups of other children less reluctantly. The greatest achievement was that M allowed her hearing to be examined which resulted in applying hearing aids.

Table 06 presents changes observed in M`s behaviour during 18 months of sensory integration therapy in the areas of smell and taste.

Table 06. Results concerning changes in M`s functioning during year and a half sensory integration therapy in the area of smell and taste

System observed	M`s behavior in therapy sessions during initial diagnosis	M`s behavior during sessions after 18 months of sensory integration therapy
Smell/taste	Bites uneatable products.	Puts uneatable products in her mouth very rarely.
	Is very sensitive to smells, has vomit reaction.	She does not react excessively to smells, vomit reaction is absent. Willingly participates in activities where she is to name a smell.
	Refuses to eat when stressed.	Refuses to eat when stressed.
	Has difficulty to tolerate when others eat food she distastes	She tolerates others eating food she distastes.
	Does not like fruit and vegetables.	Does not like fruit and vegetables
	Is selective as far as food is concerned.	-
	Likes spiced food.	-

M`s repertoire of tolerated food has not increased. M has acquired better tolerance to smells in her surroundings. The most significant change in M`s behaviour concerning taste during 18 months of therapy was elimination of vomit reaction. M has stopped to put uneatable objects in her mouth.

Data concerning changes of M`s self -control and attention focus are summarized in table 07.

Table 07. Results concerning changes in M`s functioning during year and a half sensory integration therapy in the area – self- control and attention focus

System observed	M`s behavior in therapy sessions during initial diagnosis	M`s behavior during sessions after 18 months of sensory integration therapy
Self-control and attention focus	Is impulsive and nervous, has problems with behavior and task performance organization, is distracted easily and is not able to focus on a task for more than a minute. Is in constant movement: can`t sit still at the table, jumps, runs, is nervous when has to be still and concentrate.	Is calmer, better organized, registers more stimuli and can process them. Is able to focus on a task for more 5 minutes. Can enter into relaxation.

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	Easily progresses from crying to smiling.	Quick progressing from crying to smiling does not occur.
	-	Enters into interactions with other children.
	-	Believes in her abilities, attains success more often during session. Discouragement is less frequent, verbal expression of failure is less frequent, starts to express verbally satisfaction from her progress.
	-	No self-aggressive behaviours.
	Does not allow herself to be medically examined.	Some progress with medical examination tolerance is observed.

During 18 months of SI therapy Marta has become less impulsive. She has started to enter into interactions with other children Symptoms of spontaneous self-control can be observed. Marta has become to express consent to medical examination. She no longer expresses self-aggressive behaviours. M has started to express verbally satisfaction from her progress.

7. Conclusion

The article presents a case study of M - a six year old girl with sensory registration and modulation problems and with hearing and sight deficit. The aim is to show the potential of improving the level of functioning of vestibular system, proprioception, sense organs in M and quality of her life, which was achieved during a year and a half of sensory integration therapy. The main research question was whether during a year and half of sensory integration therapy M`s functioning has changed in the areas of vestibular system, proprioception, touch, coordination, muscular tension, hearing, sight, smell, taste, self-control and attention focus? Hypotheses were formulated assuming the decrease of the number of unfavourable M`s behaviours reflecting problems in reactions connected with vestibular system (H1), proprioception (H2), touch (H3), coordination (H4), muscular tension (H5), hearing (H6), sight (H7), smell and taste (H8), as well as self-control and attention focus (H9).

Qualitative and quantitative data was gathered. Quantitative data was obtained with Sensorimotor Skills Questionnaire. The data reflected observations of M`s Mother concerning child`s behaviour in natural surroundings. Qualitative data were gathered during clinical observation and observation of child`s spontaneous behavior during sensory integration therapy. M `s Mother comments justifying her answers to Sensorimotor Skills Questionnaire were also registered in a qualitative form.

Quantitative and qualitative data was gathered during initial diagnosis and after 18 months of sensory integration therapy. The therapy was conducted by the main Author, who is a certified sensory integration therapist. Sessions took place in a room with certified equipment. Stimulation was aimed mainly at vestibular and proprioceptive system, as well as touch, hearing, sight and smell.

Qualitative data from Sensorimotor Skills Questionnaire allowed for positive verification of hypotheses assuming the decrease of unfavourable behaviours reflecting problems in the areas of touch (χ^2 =15,15; p< 0,001), proprioception (χ^2 =10,56; p<0,001), self-regulation and attention focus (χ^2 =8,71; p<0,003) and hearing (χ^2 =7,07; p<0,008).

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Qualitative data gathered during clinical observation and spontaneous observation of child`s behaviour as well as M`s Mother comments made during answering Sensorimotor Skills Questionnaire may be summarized as follows:

- In the area of proprioception and vestibular system functioning – a number of chaotic and aimless child`s movements has decreased, M`s ability to perform purposeful movements and her awareness of the position of her own body in space have increased.
- In the area of touch - disappearance of self-aggressive behaviours and increase of touch tolerance during massage with various creams, oils and materials of various structure.
- In the area of sight – M`s ability to concentrate her sight on an object and duration of eye-contact with other persons has increased.
- In the area of hearing - M tolerates better presence of talking peers and joins them. M allowed for medical examination of her hearing and uses hearing aids.
- In the area of taste and smell – M`s vomit reactions to smells have disappeared. M has also stopped to put uneatable objects into her mouth and increased a repertoire of tolerated food.
- In the area of self-control and attention focus – frequency of M`s impulsive behaviours has changed. M has begun to manifest spontaneous self-control. Self agresive behaviours no longer occur. M started to express satisfaction from her progress verbally.

The qualitative data obtained confirmed quantitative data indicating improvement in M`s functioning observed during 18 months of sensory integration therapy in terms of reactions to touch, proprioception, as well as self-regulation and attention focus. Qualitative data indicating improvement in sound processing may be a result of applying hearing aids and are not consistent with qualitative data. Qualitative observation indicated also improvement in M`s hand-eye coordination, which was reflected in quantitative data concerning behaviours dependent on vestibular system functioning.

The results obtained are in favour of A. J. Ayres` theory (Ayres, 2005). During the period in which vestibular system, proprioception, hearing, sight and taste were stimulated the improvement in child`s functioning was observed in terms of ability to integrate information from the senses. The results of other practitioners were also confirmed, concerning decrease of aversion to stimuli in oral cavity and motor skills improvement during sensory integration therapy (Shaaff, Nightlinger 2007). The data indicating favourable changes during sensory integration therapy were obtained in the case of a 6-year old girl with multiple sensory processing deficiencies.

Research results allow for formulating following conclusions:

- During 18 months of sensory integration therapy M`s self-control, reactions to touch and proprioception have improved.

Therapeutic work should be continued in all spheres, but special attention should be focused on stimulation of smell, taste, balance, hand-eye coordination and praxis.

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http://dx.doi.org/10.15405/epsbs.2017.10.73
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Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

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